AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO. TC 7.5 DATE: December 19, 2005

TC/TG/TRG TITLE: Smart Building Systems

DATE OF MEETING: June 28, 2005 LOCATION: Denver, CO

Members Present	Appt	Members Absent	Appt	Ex-Officio Members and Additional Attendance
John House, Chair (V)	03-05	Osman Ahmed (V)	02-06	Gaylen Atkinson
Steve Blanc, (V)	04-08	Arthur Dexter, IM (V)	01-05	Sharon Dinges
Michael Brandemuehl (V)	03-07	Cliff Federspiel (V)	02-06	Piotr Domanski
James Braun (V)	03-07	Jonathan Wright, IM (V)	03-07	Curtis Klaassen
James W. Gartner (V)	03-07			Thoi H. Le
Rich Hackner, Program Subc. (V)	01-05	**Corresponding Members**		Haorong Li
Phil Haves (V)	01-05	Narendra Amarani, CM	04-	Chris Miller
Bill Healy (V)	04-08	Dave Branson, CM	01-	Janice Peterson
Srinivas Katipamula; Tech. Dev. Subc. Chair (V)	01-05	Marty Burns, CM	02-	Bill Pienta
Agami Reddy (V)	02-06	Jim Butler, CM	02-	Ashish Singhal
		Charles Culp, CM	00-	Vernon Smith
Corresponding Members		David Kahn, CM	96-	Gene Strehlow
David Bornside	04-	Michael Kintner-Meyer, CM	03-	Arun Vohra
Mike Brambley, Vice Chair, Research Subc Chair, CM	03-	Mingsheng Liu, CM	03-	Jin Wen
Barry Bridges, CM	02-	Carol Lomonaco, CM	00-	
Natascha Castro, Testing & Eval Subc, Web Master, CM	04-	Darrell Massie, CM	03-	
Maria Corsi, CM	03-	John Mitchell , CM	00-	
Carlos Haiad, CM	04-	Ron Nelson, CM	98-	
Mark Johnson, CM	04-	Hung Mahn Pham, CM	01-	
George Kelly, CM	01-	Kinga Porst, CM	02-	
Leslie Norford, Handbook Subc, CM		Mike Pouchak, CM	03-	
Robert Old, CM	00-	Andrew Price, CM	03-	
Pornsak Songkakul, CM	02-	Barry Reardon, CM	99-	
Keith Temple, CM	03-	Glenn Remington, CM	02-	
Chariti Young, CM	02-	Todd Rossi, Secretary, CM	03-	
Xiaohui Zhou, CM	03-	John Seem, CM	03-	
		James Winston, CM	96-	
		Peng Xu, Comm. & Int. Subc. Chair, CM	02-	

(V) = voting member

DISTRIBUTION:
ALL MEMBERS AND CORRESPONDING MEMBERS OF TC/TG/TRG,
TAC CHAIR: William Bahnfleth
TAC SECTION HEAD: Janice Peterson
ALL COMMITTEE LIAISONS AS SHOWN ON TC/TG/TRG ROSTERS:

Program: Frank Schambach	Standards: Richard Hermans
Research: Patrick Hughes	Special Publications: Kimball Ferguson
CTT: Joseph Anderson	Staff Liaison (Stds): Claire Ramspeck
Prof. Dev.: Julian De Bullet	Staff Liaison (Resch/Tech Srvc): Michael Vaughn

"These draft minutes have not been approved and are not the official, approved record until approved by this (council/committee)."

ASHRAE TC Activities Sheet

DATE: June 28, 2005
TC NO. TC 7.5 TC TITLE: Smart Building Systems
CHAIR: John House VICE CHAIR: Mike Brambley

TC Meeting Schedule

Location, past 12 mo.	Date	Location, next 12 mo.	Date
Orlando	2/8/05	Chicago	1/24/06
Denver	6/28/05	Quebec City	6/27/06

TC Subcommittees

Subcommittee	**Chair**
Technology Development	S. Katipamula
Communications and Integration	P. Xu
Testing & Evaluation	N. Castro
Research	M. Brambley
Program	R. Hackner
Handbook	L. Norford

Program List for 2006 Chicago Meeting:

Title	**Chair**	**Status**
"Load Management: Why You Should Care and What Technology is Emerging" - Seminar	S. Katipamula	Accepted
"Economic Value of Automated Diagnostics: Who Benefits and by How Much?" - Seminar	P. Haves	Not submitted
"Wireless Sensing and Control: Where is it Needed and What Should it Control?" - Forum	M. Brambley	Accepted

Past Research Projects (last 3 years)

1139-RP Development and Comparison of On-Line Model Training Techniques for Model-Based FDD Methods Applied to Vapor Compression Equipment

Current Research Projects

Technology Development Subcommittee
1275-RP "Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II" (Phil Haves – PMSC Chair)

Testing and Evaluation
1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)

1312-TRP "Tools for Evaluating FDD Methods for AHUs" – WS-1312. Contractor Selection in Denver.

2005 – 2006 Research Plan

Priority	Project	Contributors	Status
1	Fault Detection and Diagnostics for Centrifugal Chillers – Phase 3: Real-Time Implementation	WS Contributors Srinivas Katipamula. RTAR Contributors: Srinivas Katipamula, John House, Todd Rossi, Jim Braun, Natascha Castro	Draft WS developed; Katipamula will incorporate responses to comments and Phase 2 update for Chicago meeting.
2	Conceptual Design of a Self-Configuring HVAC Control System	Michael Kintner-Meyer	Revised draft WS discussed in Denver. Revisions planned. Will be submitted for Fall or Winter evaluation by RAC, pending TC approval.
3	FDD for Supermarket Refrigeration	RTAR Contributors Daniel Choinere and John House	Updated RTAR for the Denver meeting; pending consideration by the full committee.
4	Development of metrics to evaluate benefits of sensor networks in buildings (new title)	RTAR Contributors Jin Wen and Agami Reddy. Revised by Bill Healy	Updated RTAR for the Denver meeting; pending consideration by the full committee.
5	"What If" Emulation Tool for Training and Strategizing on Building Operations	Steve Blanc	First draft of RTAR discussed at Denver meeting.
6	Whole-Building FDD	Les Norford	On hold. Les is still interested in pursuing the idea.
7	Smart Sensor Systems for Reducing Bias Errors in the Measurement of Air Temperatures and Flows in Air-Handling Units	Arthur Dexter and Phil Haves	Draft RTAR written. No progress to report. Bill Pienta from Siemens is interested in pursuing the idea.

Co-Sponsorship

	Real-Time Optimal Control in a Distributed Environment	Jim Braun, George Kelly, Maria Corsi	RTAR submitted by TC 7.4, TC 7.5 is co-sponsor. RTAR has been approved. No Progress to report.

Technical Papers from Sponsored Research

RP-1011

Final report for ASHRAE Research Project RP-1011, "Utility/Energy Management and Control Systems (EMCS) Communication Protocol Requirements" is available on the TC 7.5 web site.

RP-1020

Norford, L. K., J. A. Wright, R. Buswell, and D. Luo. 2000. "Demonstration of Fault Detection and Diagnosis Methods in a Real Building (ASHRAE 1020-RP)." ASHRAE 1020-RP Final Report.

Luo, D., L. K. Norford, S. R. Shaw, and S. B. Leeb. 2002. "Monitoring HVAC Equipment Electrical Loads from a Centralized Location - Methods and Field Test Results." ASHRAE Transactions Vol. 108(1).

Shaw, S. R., L. K. Norford, D. Luo, and S. B. Leeb. 2002. "Detection of HVAC Faults via Electrical LoadMonitoring." International Journal of HVAC&R Research, 8(1):13-40.

Norford, L.K., J. A. Wright, R. A. Buswell, D. Luo, C. Klaassen, and A. Suby. 2002. "Demonstration of Fault Detection and Diagnosis Methods for Air-Handling Units (ASHRAE 1020-RP)." International Journal of HVAC&R Research, 8(1):41-72.

RP-1043

Bendapudi, S., Braun, J.E., and Groll, E.A., "A Dynamic Model of a Centrifugal Chiller System – Model Development, Numerical Study and Validation," ASHRAE transactions, Vol. 111, Pt. 1, 18 pages, 2005.

Final report for ASHRAE Research Project RP-1043, " Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers" is available on the TC 7.5 web site.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "The Sensitivity of Chiller Performance to Common Faults," International Journal of HVAC&R Research, Vol. 7, No. 3, pp. 263-279, 2001.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "A Survey of Common Faults for Chillers," ASHRAE Transactions, Vol. 108, Pt. 1, 2002.

RP-1139

Andersen, K.K., and Reddy, T.A., 2002. "The Error in Variable (EIV) Regression Approach as a Means of Identifying Unbiased Physical Parameter Estimates: Application to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.3, pp. 295-309, July.

Reddy, T.A. and Andersen, K.K., 2002. "An Evaluation of Classical Steady-state Off-line Linear Parameter Estimation Methods Applied to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.1, pp.101-124.

Reddy, T.A., Niebur, D., Andersen, K.K., Pericolo, P.P. and Cabrera, G., 2003. "Evaluation of the Suitability of Different Chiller Performance Models for Online Training Applied to Automated Fault Detection and Diagnosis", International Journal of HVAC&R Research, Vol.9, No.4, pp. 365-384, October.

Reddy, T.A., Andersen, K.K. and Niebur, D., 2003. "Information Content of Incoming Data During Field Monitoring: Application to Online Chiller Modeling", International Journal of HVAC&R Research, Vol.9, no.4, pp.385-414, October.

TC Sponsored Symposia (past 3 years, present, planned)

Title	**Date** (Given or Planned)
FDD, Operation and Maintenance of HVAC Systems (Kelly, TC 1.4 co-sponsor)	Kansas City, 6/03
Automated Functional Testing: Methodologies and Air-Handling Unit Applications (House)	Orlando, 1/05
Software Tools for Building Commissioning (House)	Quebec City, 6/06

TC Sponsored Seminars (past 3 years, present, planned)

Title	**Date** (Given or Planned)
Automated Functional Testing of HVAC Systems (Haves, TC 1.4 and 4.6 co-sponsors)	Chicago, 1/03
New Issues with State-of-the-Art DDC (Atkinson, TC 1.4 and 1.5 co-sponsors)	Chicago, 1/03
Wireless Sensors for Building Applications (Healy, TC 1.4 co-sponsor)	Kansas City, 6/03
Improved Operations for California Buildings -Part 1 (Haiad, TC 7.4 lead)	Anaheim, 1/04
Improved Operations for California Buildings -Part 2 (Scruton, co-sponsored with TC 7.4)	Anaheim, 1/04
Automated Commissioning Tools (Maria Corsi, co-sponsored with TC 7.3)	Anaheim, 1/04
State of the Art Issues for DDC Systems (Atkinson, TC 1.4 lead)	Anaheim, 1/04
Models for Automated Building/HVAC Fault Detection and Diagnostics (Brambley, co-sponsored with TC 4.7)	Nashville, 6/04
Demand Response and Building Control (Xu, TC 7.4 lead)	Nashville, 6/04
Control Challenges and Opportunities with Emerging DDC Technologies (Bridges, TC 1.4 lead)	Orlando, 1/05
Future Intelligent Control Systems: They are Here Today (Braun, TC 7.4 lead)	Orlando, 1/05

TC Sponsored Forums (past 3 years, present, planned)

Title	**Date** (Given or Planned)
What Should ASHRAE's Role be in IFC and XML Standards (Gowri, GPC20 and TC 1.5 co-sponsor)	Chicago, 1/03
Achieving Market Acceptance of HVAC Fault Detection and Diagnostic Systems (Goetzler, co-sponsored with TC 7.4)	Orlando, 1/05
What the utility wants to do to your building and how you will benefit (Kintner-Meyer, TC 7.4 co-sponsored)	Denver, 6/05

TC Sponsored Public Sessions (past 3 years, present, planned): None
Journal Publications (past 3 years, present, planned): None

ASHRAE TC 7.5, Smart Building Systems

June 28, 2005 – Denver, CO

Call to Order, Roll Call, Introductions

The meeting was called to order at 3:35 PM with Chairman John House presiding. Roll call was taken with 10 of 14 voting members in attendance. House distributed the Agenda (the call-to-meeting letter and the agenda are in Appendix A).

Voting members present: Steve Blanc, James Braun, James Gartner, Rich Hackner, Carlos Haiad, Phil Haves, Bill Healy, Srinivas Katipamula, Agami Reddy, John House

Committee Scope

The Chair read the committee scope for the benefit of all in attendance. (see Appendix B)

Approval of Minutes

House asked for comments and changes to the Nashville minutes. Mike Brambley noted that the table providing the status of various research topics needs to be updated and that he would provide the updated table. Natascha Castro indicated that the program list for Denver (table on page 3) was incorrect and needed to be updated.

Motion: Move to approve minutes subject to noted changes (Motion: Steve Blanc, Second: Mike Brandemuehl). **Vote:** 9/0/0, chair not voting.

Chair's Announcements – John House

House attended the TC Chair's Breakfast Meeting for Section 7 on Sunday morning. Announcements stemming from the meeting follow:

1. ASHRAE's Program Committee is considering shortening seminars and symposia to 90 minutes. Another change under consideration is to modify the symposium review process to include one reviewer identified by ASHRAE and two reviewers identified by the symposium chair. In the past, the symposium chair has selected all three reviewers. Comments concerning the changes are invited.

   Discussion ensued about these program issues. House noted that other TC chairs from Section 7 seemed to agree that a 50-minute symposia was not sufficient time. Keith Temple noted that TC 6.3 found a large number of seminars with three speakers on the program for Denver, each getting a two-hour session, and a number of symposia with thee speakers that were restricted to 50 minutes. The change to utilize one reviewer identified by ASHRAE appears to be in response to a concern that a rigorous review process is not always occurring.

   ACTION: House will write a letter to the Program Committee and the Section 7 Program Liaison protesting the 50-minute symposia and will ask other Section 7 TC's send similar letters.

2. TC 7.1 Integrated Building Design has been assigned responsibility by ASHRAE for providing content for a web-based interactive "Whole Building Design Guide" being developed by NIBS (National Institute of Building Science). This will require a great

deal of effort and may be an opportunity for collaboration/input from other TCs. Information on the Design Guide can be found at www.wbdg.org.

3. Section 7 TC Chairs are asked to read the Section 7 MBOs (management by objective) at TC meetings. The updated MBOs for Section 7 are:

   a. Submit TC meeting minutes in a timely manner.
   b. Each TC should have and maintain a web site that is linked to ASHRAE's web site
   c. Forum 22 - "Measured Performance of Buildings: What's Needed – Guideline, Standards, or ?" is an opportunity to identify areas of collaboration for Section 7 TCs
   d. TCs are encouraged to assist TC 7.1 in providing content for the "Whole Building Design Guide" being developed by NIBS

4. Webmaster training will be held again in Chicago.

5. A TC/TG chair training workshop is held Sundays at 3:15 and is very helpful acclimating incoming chairs to the responsibilities of the position.

6. Steve Kavanaugh has written a book entitled "HVAC Simplified" and has offered it for publication by ASHRAE. ASHRAE is looking for reviewers and is trying to identify a cognizant TC to look at the book content. Send Peterson an email if you are interested in reviewing the book.

7. ASHRAE has a new Listserv service available for use by members.

8. ASHRAE will send a thank you letter to employers for anyone who requests such a letter. TC Chairs are asked to please circulate the sign-up list at TC meetings and return the list to Beverly Nash at ASHRAE.

9. The Society would like feedback from the membership concerning ASHRAE's role in the area of sustainability.

Technology Development Subcommittee – Srinivas Katipamula

Srinivas Katipamula provided a brief overview of the current and future research activities that are underway in the Technology Development Subcommittee. Currently, there is one active research project underway, RP-1275 Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers - Phase II. Phil Haves, PMSC chair, provided a report from the PMSC meeting. The report is provided in Appendix I.

In the subcommittee meeting on Sunday, considerable time was devoted to the discussion of two RTARs: 1) "Fault Detection and Diagnostic Methods for Supermarket" and 2) "Development of Metrics to Evaluate Benefits of Sensor Networks in Buildings."

Based on the discussion on Sunday, both RTARs were updated and are being recommended for a vote by the full committee. After a brief discussion of the RTARs, the committee decided to vote to recommend both the RTARs to ASHRAE research.

Motion: Move to approve the RTAR titled "Fault Detection and Diagnostic Methods for Supermarkets" subject to minor revisions and forward it for consideration by RAC (Motion: Srinivas Katipamula, Second: Rich Hackner). **Vote:** 8/0/0, chair not voting (Phil Haves had

stepped out of the room).

Motion: Move to approve the RTAR titled "Development of Metrics to Evaluate Benefits of Sensor Networks in Buildings" and forward it for consideration by RAC (Motion: Jim Gartner, Second: Phil Haves). **Vote:** 8/0/0, chair not voting (Jim Braun had stepped out of the room).

ACTION: Bill Healy will request co-sponsorship of the RTAR by TC 1.5 and TC 1.4.

Mike Brandemuehl suggested that each RTAR would benefit from a sentence linking the RTAR to the ASHRAE strategic research plan.

Katipamula concluded his report by indicating that the subcommittee is considering an RTAR on sensor errors. Bill Pienta from Siemens is going to update the current draft RTAR for the next meeting.

Communications and Integration Subcommittee – Rich Hackner reporting for Peng Xu
Rich Hackner reported that one RTAR and one work statement were discussed in the meeting.

Steve Blanc described an RTAR on "What if simulation tool for training and strategizing on building operation." Comments were collected. Blanc will revise the RTAR for the Chicago meeting.

Michael Kintner-Meyer described the work statement titled "Conceptual Design of a Self-Configuring HVAC Control System." Kintner-Meyer will try to have a revised version for consideration by the committee at the Chicago meeting.

TC 7.5 Testing and Evaluation Subcommittee Report – Natascha Castro
Natascha Castro summarized research in the subcommittee, stating that there is one on-going research project, 1274 RP, "Field Performance Assessment of Packaged Equipment to Quantify the Benefits of Proper Service." There are also two active work statements: 1) WS 1312 and 2) Chiller Phase III.

1) WS 1312 "Tools for Evaluation FDD for AHUs" – the PES met on Monday June 27th to make a contractor recommendation which will be discussed in executive session at the end of the meeting.

2) WS Chiller Phase III – Fault Detection and Diagnostics for Centrifugal Chillers, Phase III: Real Time Implementation. Srinivas Katipamula summarized the WS and highlighted the unanswered questions that are pending the end of Phase II as well as major comments from the subcommittee. The budget was raised to $195K.

ACTION: Katipamula will update the work statement based on comments from other contributors.

Keith Temple provided an update on 1274 RP. Testing has been initiated with 18 units tested, though there is a delay. Completion set for April 2006 is not likely. Six units have undergone evaluation after servicing. There was a question as to what criteria were used to determine the units that would be serviced and retested. In all, of the 375 units tested, 75 will be serviced and retested. The criteria for selection of the units to be retested are important and ideally a random sampling method would be used. There was also some concern about the calculations used to

evaluate the performance of the units. Finally, the contractor was asked to make a formal report in Chicago. A detailed report of the PMSC meeting is provided in Appendix H.

ACTION: House will follow-up with Todd Rossi (chair of the PMSC) concerning membership on the PMSC and scheduling of the next PMSC meeting.

Research Subcommittee – Mike Brambley

Mike Brambley started with a brief report on the Research Subcommittee Chairs breakfast on Monday morning. Announcements and presentations at that meeting included:

1. Presentation on the new proposed ASHRAE research plan. Copies of materials are provided in the file DraftASHRAEResearchPlanMay2005.pdf, which is provided as a separate electronic attachment.
2. Presentation of the RTAR and work statement evaluation process and criteria. Copies of materials are provided in the file RTAR&WS CriteriaPresentationJune2005.pdf, which is provided as a separate electronic attachment.
3. Presentation by John Wimer and Davor Novosel from the National Center for Energy Management and Building Technologies, which apparently is looking to collaborate on research with ASHRAE. Copies of the presentation and handouts are attached as a separate electronic attachments NCEMBTPresentation.pdf and NCEMBT Handout.pdf.
4. Service to ASHRAE Research Award nominations are due at the end of September.
5. An effort is underway to convert the research manual to a web tool in the next few months. Aim is to have the total manual done by Chicago.
6. In writing RTARs and Work Statements, show the linkages to the research plan.
7. The process for evaluation of RTARs and Work Statements is now documented in a diagram in the file RTAR&WS CriteriaPresentationJune2005.pdf.
8. RTARs will now be evaluated three times per year. Due dates for submission for these evaluations are: August 15, December 15, and May 15, which are approximately 45 days in advance of the Society meeting or RAC meeting.
9. There is currently no backlog of approved projects, so projects approved will go out quickly for bid.
10. There is no formal maximum on the number of RTARs submitted, but try to keep the number submitted per meeting reasonable. A TC can reprioritize RTARs when submitting them. The research plan is a document mostly for TC use. RAC does not really use it, however, the ASHRAE Manager of Research likes to have them.
11. The life of an RTAR is 4 meetings (2 years), but an RTAR can be resubmitted when it drops off the list.

Brambley distributed a list of research topics with a proposed prioritization order for the long range research plan. Discussion ensued prior to a motion to accept the research plan as prioritized in the table on page 4 on these minutes.

Motion: Move to the long range research plan as prioritized (Motion: Mike Brandemuehl, Second: Phil Haves). **Vote:** 8/0/0, chair not voting.

Brambley summarized the web discussion and further discussion on reorganization of the topical subcommittees that took place in the Research Subcommittee meeting. Brambley asked for anyone who was not yet registered for the Google online discussion group on TC 7.5 research to please provide him a card or send an email indicating the desire to be added.

John House reported (as he did in the Research Subcommittee meeting) that after a month or so of additional discussion via the web after the Denver meeting, he (as Chair) and Mike Brambley (as vice chair) would decide based on the input provided in all the discussion what changes to implement. These would then be implemented prior to the next meeting in Chicago.

Brambley concluded his report by noting that concern has been raised contractors of ASHRAE research about a lack of responsiveness by Project Monitoring Subcommittees. Brambley was asked to bring this concern to the committee anonymously and noted that to his knowledge the comment was not directed at any particular individual or PMSC.

ACTION: House will follow-up with all TC 7.5 PMSC Chairs and convey this concern about PMSC responsiveness.

Program Subcommittee – Rich Hackner

Rich Hackner distributed a handout listing program items under consideration (see Appendix G). The handout included a suggested prioritized program list for the 2006 Winter Meeting in Chicago:

Priority 1: Seminar *"Electric Load Management: Why Should You Care and What Technologies are Emerging to Help You"* (Chair: Michael Brambley and Srinivas Katipamula)
Possible Co-Sponsors: TC 1.4 and TC 7.4

Priority 2: Seminar *"Economic Value of Automated Diagnostics ….Who Benefits? ..and How Much?"* (Chair: Phil Haves)
Possible Co-Sponsors: TC 1.4 and TC 7.4

Priority 3 Seminar "*Wireless Sensing and Control…Where Is It Needed and What Should It Control?"* (Chair: Michael Brambley)
Possible Co-Sponsors: TC 1.4 and TC 7.4

Motion: Move to approve the program plan as prioritized (Motion: Phil Haves, Second: Steve Blanc). **Vote:** 8/0/0, chair not voting.

TC 1.4 Chair Charity Young indicated that TC 1.4 will cosponsor the forum on wireless sensing and control.

Handbook Subcommittee Report – Les Norford

The chair of the committee drafted material on fault detection and diagnosis, as described in the subcommittee report in the TC 7.5 minutes for the February 2005 meeting in Orlando. The material emphasizes studies on chillers and air conditioners that report on observed faults and the benefits of their detection. This material was shared electronically with TC 7.5 members prior to the Denver meeting.

The same material was presented at the meeting in Denver of the handbook subcommittee of TC 7.3, Operation and Maintenance Management, for inclusion in Chapter 38 of the ASHRAE Applications Handbook, which will be revised in print form in 2007.

TC 7.3 members at that meeting reviewed the material and asked for several revisions to make the material more concise and to improve the figures. The material will be revised and

resubmitted to TC 7.3 before the Chicago ASHRAE meeting. TC 7.3 is scheduled to approve its revised handbook chapter at Chicago.

Norford asked TC 7.5 to endorse the submittal of the proposed FDD material to TC 7.3.

Motion: Move to have TC 7.5 provide material on FDD suitable for inclusion in the O&M handbook chapter to TC 7.3 for their consideration (Motion: Steve Blanc, Second: Jim Gartner). **Vote:** 7/0/0, chair not voting.

Norford will inform TC 7.5 of revisions that come from the interaction with TC 7.3.

Web – Natascha Castro

Natascha Castro commented on ASHRAE's web service limitations. Castro indicated that NIST would continue to host the TC 7.5 web site.

Homeland Security

House announced that ASHRAE has asked the TCs to include an item on the agenda for homeland security. House suggested this might be an area in which TC 7.5 could develop research topics.

Old Business

None

New Business

Roster Changes – Roster changes take effect July 1, 2005. Arthur Dexter, Rich Hackner, Philip Haves, and Srinivas Katipamula will roll off the committee as voting members. House thanked them for their service to the committee. House welcomed Peng Xu and Mike Brambley as new voting members of the committee.

Adjourn

Motion: Move to adjourn (Motion: Jim Gartner, Second: Steve Blanc). Motion approved by unanimous voice vote.

Executive Session – Contractor Selection for 1312-TRP

A contractor was recommended for 1312-RP "Tools for Evaluating Fault Detection and Diagnosis Methods for Air-Handling Units". (Motion: Phil Haves, Second: Rich Hackner) **Vote:** 8-0-0 (chair voting).

Appendices

A. Call to Meeting and Agenda
B. Scope and Organization
C. Technology Development Subcommittee Meeting
D. Communications and Integration Subcommittee Meeting
E. Testing and Evaluation Subcommittee Meeting
F. Research Subcommittee Meeting
G. Program Notes
H. 1274-RP PMSC Notes
I. 1275-RP PMSC Notes
J. List of Subcommittee and Committee Attendees

Appendix A.
TC 7.5 Call to Meeting and Agenda

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

1791 Tullie Circle, NE, Atlanta, Georgia 30329-2305 404-636-8400 | Fax 404-321-5478

Reply to: John House
CANMET Energy Technology Centre
1615 Lionel-Boulet Blvd., P.O. Box 4800
Varennes, Quebec J3X 1S6
CANADA
John.House@NRCan.gc.ca

May 30, 2005

Dear TC 7.5 Member, International Member, or Corresponding Member:

The **TC** on Smart Building Systems will meet in the Adam's Mark Hotel in Denver according to the following schedule:

TC 7.5	Tech. Development	Sunday (6/26)	3:00-3:40p	Governors Sq. 14 (Concourse)
TC 7.5	Comm. & Integration	Sunday (6/26)	3:40-4:20p	Governors Sq. 14 (Concourse)
TC 7.5	Testing & Evaluation	Sunday (6/26)	4:20-5:00p	Governors Sq. 14 (Concourse)
TC 7.5	Research	Sunday (6/26)	5:00-5:40p	Governors Sq. 14 (Concourse)
TC 7.5	Handbook	Sunday (6/26)	5:40-6:00p	Governors Sq. 14 (Concourse)
TC 7.5	PMS 1274-RP	Sunday (6/26)	6:00-7:30p	Governors Sq. 14 (Concourse)
TC 7.5	PMS 1275-RP	Tuesday (6/28)	1:30-3:00p	Tower Court D (Second Level)
TC 7.5	**Smart Building Systems**	**Tuesday (6/28)**	**3:30-6:00p**	Tower Court D (Second Level)

TC 7.5 is co-sponsoring the following program session:

Forum 26: What the Utility Wants to Do to Your Building and How You Will Benefit
(Co-sponsored by TC 7.5 and TC 7.4)
Wednesday, June 29, 2005, 8:00 AM – 8:50 AM, Moderator: Michael Kintner-Meyer

Attached is a draft agenda for the full TC 7.5 committee meeting. I hope to see you all in Denver.

John House
Chairman, TC 7.5

ASHRAE TC 7.5, Smart Building Systems
2005 Annual Meeting
Denver, CO

AGENDA

Location: **Adam's Mark Denver; Tower Building / Tower Court D (Second Level)**
Date: **Tuesday, June 28, 2005**
Time: **3:30 - 6:00 p.m.**

1. Roll Call and Introductions

2. TC 7.5 Scope

3. Approval of Orlando Minutes

4. Announcements

5. Technology Development Subcommittee (Srinivas Katipamula)
   - Report on 1275-RP "Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II" (Phil Haves – PMSC Chair)

6. Communications and Integration Subcommittee (Peng Xu)

7. Testing and Evaluation Subcommittee (Natascha Castro)
   - Report on 1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)

8. Research (Mike Brambley)

9. Program Subcommittee (Rich Hackner)
   - Plans for Chicago and Quebec City

10. Handbook (Les Norford)

11. Web (Natascha Castro)

12. Homeland Security

13. Old Business

14. New Business
    - Roster Changes

15. Adjournment

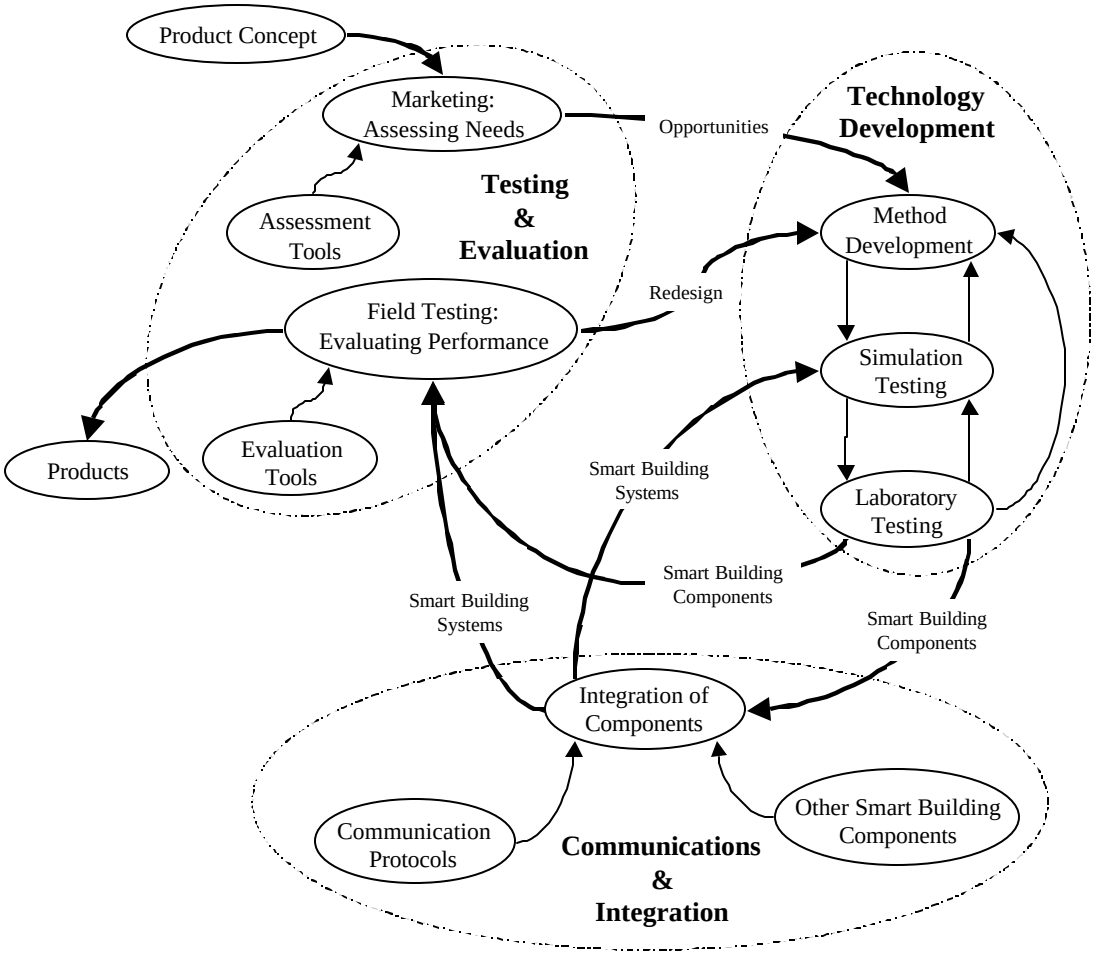
16. Executive Session
    - Contractor selection for 1312-TRP "Tools for Evaluating Fault Detection and Diagnosis Methods for Air-Handling Units"

Appendix B.
TC 7.5, Smart Building Systems Scope and Organization
Revised July 1, 2001

Overall Committee Scope

The Technical Committee on Smart Building Systems (SBS), TC 4.11, is concerned with the development and evaluation of technologies that could enable the widespread application of smart building systems. "Smart" buildings should take advantage of automation, communications, and data analysis technologies in order to operate in the most cost-effective manner. This implies integration of building services such as HVAC, fire, security, and transportation; the automation of many of the operation and maintenance functions traditionally performed by humans; and the interaction with outside service providers such as utilities, energy providers, and aggregators. Currently, three subcommittees form the backbone of the TC's activities: technology development, communications and integration, and testing and evaluation. The scope and activities of these subcommittees loosely follow the product development process as depicted in following flow chart and as defined in the following sections.

Smart Building System Development Process



Appendix C.
TC 7.5 Technology Development Subcommittee Meeting

June 26, 2005 – Denver, CO
Notes by Srinivas Katipamula, Subcommittee Chair

List of attendees
See attendance sheet in Appendix J.

General Overview of Subcommittee Activities
Srinivas began the meeting by summarizing the three main items to be discussed:

- RP-1275 - Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers- Phase II
- RTAR titled, "Fault Detection and Diagnostic Methods for Supermarkets."
- RTAR titled, "Development of metrics to evaluate benefits of sensor networks in buildings."

We currently don't have any active RTARs on the research plan from this subcommittee.

Other research ideas in the hopper:

- Sensor errors – No progress on this idea for a long time, but we still have a few volunteers interested in the topic including Bill Pienta from Siemens who wants to take the lead. Others interested in the topic are Arthur Dexter, Phil Haves and Charlie Culp.
- Whole building FDD – Les Norford is still interested in the topic.
- We are working with TC 7.4 on draft work statement on Real-Time Optimal Control in a Distributed Environment (we will be considering co-sponsoring this work).

RP-1275
Drexel University is the contractor conducting the research. The PMS has not met yet, so we don't have an update but it appears significant progress has been made. More details on the progress will be provided at the full committee meeting on Tuesday. If any one needs more information please contact Agami Reddy from Drexel.

Current Research Topics

John House provided a brief overview of the Supermarket FDD. Following that, there was considerable discussion of the Supermarket FDD RTAR. Several minor changes were suggested. It was also decided that the work should be done in two phases. It was also suggested that we need to get the TC 10.7 engaged and get them to co-sponsor the work. The subcommittee decided that if the changes suggested we made before the full committee meeting we should recommend the RTAR be voted by the full committee.

Bill Healy then discussed the RTAR on sensor networks. This RTAR was previously drafted by Jin Wen. Bill modified it significantly based on the input provided to him in the last meeting. After some discussion the subcommittee suggested minor changes and recommend that the full committee vote on it at the full committee meeting.

New Research Topic
There was not time to discuss new ideas at this meeting.
Agami was asked to prepare a 1-2 page write-up.

Appendix D.
TC 7.5 Communications/Integration Subcommittee

June 26, 2005 – Denver, CO
Notes by Peng Xu, Subcommittee Chair

Communication and integration subcommittee
1) "What if simulation tool for training and strategizing on building Operation."
Steve gave a brief introduction of the RTAR. The document provides more detailed information than last time. The tool can be used to train building operator to understand how building interact with each other. The current scope only covers the first round of the tool developing. The project will provide a concept and test the concept and see whether it is feasible for economic reasons. Economic is one of the most important factors here. It takes lots of the effort to build simulation models. Lot of questions is still unanswered.

Comments: People built an emulator in Annex17 a while ago. PNNL, IOWA, and many other agents are involved. The emulator was a real time emulator, which use the simulation to test control hardware and software.
Steve's counter comments: Many real time emulators have been built. But they need to run in fast clock and demonstrate economically feasible.

Comments: There is a technical session 1 on Tuesday by Gregory Henze on "A mobile laboratory for building automation and control systems part 1: laboratory development". There might be some overlap between this project and their research.

Comments: Any feedback from other 4.7 and 7.4? They both have similar project proposing.

Comments: Maybe it needs to make distinguish between software development and research. Make sure it is not just software development.

Comments: SPARK and EnergyPlus can be good vehicles to carry this.

Comments: License issue of the EnergyPlus will prohibit this.

Status: Anyone interested in working on the next draft please contact Steve Blanc. There will be a new draft available for the Chicago Winter Meeting (2006).

2) Conceptual design of a self-configuring HVAC control system
Michael Kintner-Meyer gave a short introduction. Major changes have been made. The scope was too large before and he de-scoped it into the current form. The current scope includes a literature review of other industries, and the conceptual design Whatever is necessary to achieve the auto configuration.

Comments: It was prioritized RTAR a while ago. Mike Brambley will check the current priority status.

Comments: Two years is too long for the current scope and the budget is too high. At least 90K is needed.

Comments: Validation of cross study to verify the results of the study. Maybe the bidder needs to put a guideline on how to assess the conceptual design.
Comments: The current RTAR focus on the first stage of a long term goal. It is better to provide the long term goal in document.

Comments: Should we vote it this time or Chicago meeting.

Counter-comments: If the author can modify the work statement before Tuesday, we can vote on it. Otherwise, we have to wait for next meeting in Chicago.

Status: Next draft was not available for discussion during the Denver meeting. There May be another draft prepared prior to Chicago.

3) Dave asked for inputs on "IntelliGrid"
He asked whether anyone could provide input about the connection between utility and BACNet. Right now, we have load control in BACNet. There are several projects in California about connection between utility and BACNet. Anyone have any comments or input?

Program

1) "Electricity load management, why should you care?" Srinivas has several potential speakers. Seminar. Chicago.
2) Wireless, "Wireless sensor and control". Seminar. Chicago. Mike Brambley is leading this effort.

Appendix E.
TC 7.5 Testing and Evaluation Subcommittee Meeting

June 26, 2005 – Denver, CO
Notes by Natascha Castro, Subcommittee Chair

Natascha noted that there are two main items for discussion: 1) WS 1312 and 2) Chiller Phase III.

WS 1312 "Tools for Evaluation FDD for AHUs" – John House reported that the PES would meet on Monday June 27th to make a contractor recommendation.

Chiller Phase III– Srinivas Katipamula restated the potential issue with the Field Diagnostics' patent on FDD for vapor compression systems, which appears to cover phase III chiller work. A consultation with Mike Vaughn Director of Research, ASHRAE resulted in two suggestions: 1) for the TC to justify the need for the research, and 2) for a letter from the patent holder stating their position on the proposed research. There was significant discussion on this point. The Subcommittee saw significant value in pushing research beyond the current state of the art.

Action: to continue with an off-line discussion and make a recommendation to the TC
- what are the patent claims
- legal review

Srinivas summarized the WS and highlighted the unanswered questions that are pending the end of Phase II.

Discussion point 1: Determine what faults need to be detected on-line
- RTAR was written up as on-line, real-time evaluation of methods
- House: Based on Phase I and II, determine if on-line is a necessity. Is real-time pushing the envelope?
- Brambley: Methods can be used off-line, but special efforts in development are needed to reach real-time.
- Norford: Has merit because we are developing a tool that is completely automated.

Discussion point 2: Method evaluation
- Need a list of faults (naturally occurring and simulated)
- Need to clarify bidder information; will there be credit for more field tests?
- Brambley: Do results from lab tests influence

Discussion point 3: Do we want to detail chiller specifications
- Tonnage? Is a single site ok? Chiller diversity (age)?
- Should list preferred specifications for the end result

Discussion point 4: $120K is not sufficient for conducting a laboratory tests as well tests at three field test site.
- Braun recommended that we considering raising the budget to $195K.

Action: Srinivas will update WS with contributors based on discussions.

Appendix F.
TC 7.5 Research Subcommittee Meeting

June 26, 2005 – Denver, CO
Subcommittee Chair – Mike Brambley

Brambley reviewed the agenda and asked for revisions. No revisions were suggested.

Brambley asked the topical subcommittee chairs to please provide him updates on status for the TC 7.5 Research Plan before the full committee meeting on Tuesday on the Research Plan sheet. To save time, the discussion that had taken place earlier in those subcommittee meetings was not reviewed.

Brambley reported on the online discussion on TC 7.5 research set up under Google groups. He reported that everyone who indicated interest in participating in the discussion was invited by email to join. Twenty three invitations were sent out. He invited anyone else who had not been invited or lost their invitation to provide their name and email to him and he would add them to the discussion group shortly after the subcommittee meeting.

The two questions posed in this discussion were:

1. Is the current TC 7.5 research agenda appropriate for the committee's future?
2. Should TC 7.5 reorganize its topical subcommittees? If so, how? Should we:
    a. keep the current structure?
    b. collapse the 3 topical subcommittees to one?
    c. establish a completely new structure with an as yet to be determined number of subcommittees, with new titles and scopes?

Brambley summarized the discussion that had taken place on line as follows.

Issue 1: There was not much discussion of this issue directly, although it would seem appropriate to consider this issue before the second. The discussion was somewhat peripherally related though.

Glen Remington raised a question regarding whether the real world was moving faster than TC 7.5 in the area of fault detection and diagnostics (FDD). He observed that some commercial things are starting to appear on the market, and sited advancements by Boeing in the aircraft field.

Mike Brambley responded to Glens posting by suggesting that for the most part automated FDD is still in its infancy across fields. He provided a reference from the 2004 American Control Conference supporting this claim. Brambley also expressed that the drivers and constraints on applications of FDD differ in the various industry, comparing FDD in the air craft industry where large numbers of sensors can be used with buildings where the addition of even one sensor is scrutinized because of it impact on cost. He suggested that the committee become familiar with FDD R&D in other fields but be careful to assess its applicability to the buildings environment.

Issue 2: John House expressed a preference for collapsing the three topical subcommittees of

TC 7.5 to one. He identified two primary reasons for holding this view: 1) too often productive discussions are cut short because of the time limit in one subcommittee, while time is filled with unproductive discussions in another and 2) the current structure does not provide sufficient time to step back and brainstorm new ideas for the TC overall. John supported a proposal by Phil Haves from the last meeting in Orlando to collapse the three subcommittees into one and then follow a process at the meetings of brainstorming, prioritizing, and detailed RTAR/work statement discussion.

Brambley responded with five observations on the negative side of collapsing the 3 topical subcommittees into one. Briefly, they were

1. Concern that committee gets further channeled into only one area of investigation, FDD.
2. More subcommittees provide more opportunities for involvement in committee leadership and cultivation of future committee officers.
3. Wasted time may not be so much related to having multiple subcommittees but rather lack of adequate time management in the meeting and possibly having all meetings held consecutively in the same room.
4. To give each subcommittee more of a sense of having its own meeting (time and place), the committee might consider breaking apart the subcommittee meetings in time and location.
5. Often too much time is spent discussing minor details of RTARs and Work Statement in the meetings. More of this work should be done outside of subcommittee meetings and then progress and status reported in the meetings. Focus on the larger issues and decisions in the meetings.

He suggested that the committee be careful to consider the downside as well as the upside before deciding on changes to the committee structure.

House responded by noting that the committee has always been relatively narrowly focused on FDD and has struggled in the area of Communications and Integration. He agreed that the current structure does allows more individuals to participate in committee leadership but also observed that he has heard comments that the structure is very confusing. John also agreed that the committee spends too much time discussing minor details of RTARs and Work Statements in meeting and he was going to make a conscious effort to minimize this and would encourage subcommittee chairs to do the same.

Peng Xu offered some observations and suggestions, starting with his concern about collapsing the three subcommittees into one, while agreeing with House's observation that the TC has already become narrowly focused on FDD. Peng identified three issues he felt the TC needs to deal with in this discussion of reorganization:

1. New comers are often confused with the names of the three subcommittees, so maybe we should rethink the naming.
2. Better use of time. Peng suggested the 3 chairs meet before the meetings to discuss items on their agenda and then divide the time between them.
3. More inspiring discussion. Peng observed that the specific people who attend drive the direction of the discussion. He suggested that attracting newcomers and spending less time on details of RTARs and WSs might improve the discussion. He also noted that resolving the time conflict with TCs 1.4 and 1.5 would also help.

Peng ended with three recommendations:

1. Let the subcommittee chairs spend 5 minutes before the meeting to review their agenda and divide up the meeting time.
2. Hold a discussion about the names of the subcommittees.
3. If the TC collapses to one subcommittee, different people should lead discussion on different topics during the meeting.

Brambley added that a new RTAR on wireless sensing would be considered at the next meeting and this could be a growing area for the TC. He further suggested that maybe the TC should not view the subcommittees and their titles as fixed with long lives but something that evolves as interests of the participants change. He suggested 3 areas where there seems to be current interest in Smart Building Systems and suggested possibly reorganizing the subcommittees around these:

1. FDD
2. building/utility interactions and
3. wireless communications for sensing and control.

He added that rather than covering all of Smart Building Systems that the committee cover areas for which there are critical masses of participants (at least 3 or 4).

Bob old suggested that the TC should ask a wider group of the Society for topics of interest, starting with checking with other committees in which the members of this TC participate. He further suggested a forum asking for such input. He also supported the idea of transient subcommittees focused on one topic.

Further discussion of the organization of the committee ensued for about 10 minutes. Near the end, John House suggested that this discussion continue for a short time online after the Denver meeting and then that he (as Chair) and Mike Brambley (as vice chair) decide based on the input provided in all the discussion what changes to implement.

The subcommittee meeting was adjourned.

Appendix G.
Program Notes

June 28, 2005
Notes by Rich Hackner – Program Chair

Suggested Prioritized Program List for 2006 Chicago Winter Meeting:

Priority 1 Seminar *"Electric Load Management: Why Should You Care and What Technologies are Emerging to Help You"* (Chair: Michael Brambley and Srinivas Katipamula)
Possible Co-Sponsors: TC 1.4 and TC 7.4

Priority 2: Seminar *"Economic Value of Automated Diagnostics ….Who Benefits? ..and How Much?"* (Chair: Phil Haves)
Possible Co-Sponsors: TC 1.4 and TC 7.4

Priority 3 Seminar *"Wireless Sensing and Control…Where Is It Needed and What Should It Control?"* (Chair: Michael Brambley)
Possible Co-Sponsors: TC 1.4 and TC 7.4

History

The TC 7.5 prioritized program for Denver was:

Priority 1: Forum *"What the Utility Wants to Do to Your Building and How You will Benefit"* (Chair: Michael Kintner-Meyer)

Status: Mix-up in Submission. Denver Program listed as sponsored by TC 7.4

Priority 2 Seminar *"Economic Value of FDD ….Who Benefits? ..and How Much?"* (Chair: Phil Haves)
Co-Sponsors: TC 7.4

Status: Pulled by Chair

Priority 3 Forum *"Wireless Sensing and Control…Where Is It Needed and What Should It Control?"* (Chair: Michael Brambley)
Co-Sponsors: TC 1.4? and TC 7.4

Status: Not accepted

MEETING SITE AND DATE	DATE TECHNICAL PAPERS AND SYMPOSIUM PAPERS ARE SUBMITTED TO BEGIN REVIEW PROCESS ON ASHRAE MANUSCRIPT CENTRAL.	DATE FOR ALL COMPLETED PROGRAMS TO BE SUMITTED ONLINE and TECHNICAL PAPERS TO FINISH REVIEW	NOTIFICATION OF PROGRAM S SCHEDULED FOR THE MEETING SENT OUT BY MAILED LETTER
Orlando, Florida February 5-9, 2005	April 2, 2004	August 6, 2004	During week of September 6, 2004
Denver, Colorado June 25-29, 2005	September 24, 2004	February 18, 2005	During week of March 7, 2005
Chicago, Illinois January 14-18, 2006	April 1, 2005	August 5, 2005	During week of September 5, 2005
Quebec City, Canada June 24-28, 2006	September 23, 2005	February 10, 2006	During week of March 6, 2006

Other Ideas for Denver and Beyond

Symposium (Quebec City?)
Software Tools for Building Commissioning
Lead: John House
Co-sponsors: 7.9?

Seminar
FDD…Fault Detection and Diagnostics…but What about "Correction?"
Lead: Someone from PNNL?
Co-Sponsors: TC 7.4?

Seminar
Peel and Stick….The Future in HVAC Sensing Technology?
Lead: Michael Brambley
Co-Sponsors: TC 1.4?
Possible Speakers: Mike Schell and Glen Remington

Forum
FDD Needs for Data Centers
Lead: Phil Haves
Co-Sponsors: TC 7.4, TC 9.9 Mission Critical Facilities?

Forum
What Makes a Smart Building "Smart"
Lead: ???
Co-Sponsors: TC 7.4

Appendix H.
1274-RP PMSC Notes

June 26, 2005
Notes by Keith Temple – PMSC Member

Contractor:
Dan Mort – ADM Associates

Guests Present:
John House
Vance Payne

PMS Members Present:
Steve Blanc
Michael Brambley
Ken Peet
Keith Temple

PMS Members Absent:
Todd Rossi – PMSC Chair
Chris Scruton
Jim Braun
Pantelis Hatzikazakis

Meeting chaired by Keith Temple in Todd Rossi's absence

1. Since the last meeting the contractor had revised the document "Field Diagnostic Test On-Site Procedure for Roof Top Unitary Equipment" (dated March 3, 2005) and made the document available to the PMSC by posting on their website.
2. Several members of the PMS reported that they were not able to access the website. The contractor will resolve and notify the PMS members by e-mail. The message will include the current login information and status of information available.
3. The contractor reported the status of the project. Three teams have been trained and are conducting field tests. Baseline measurements were completed for 18 units. Six of the units had servicing and post testing. Four of the units had servicing and are scheduled for post testing.
4. The contractor presented baseline and post data sheets for 4 units. The PMS members had the following comments:
    a. The contractor was requested to summarize, in one document, the equations and tables used in the associated calculations.
    b. The contractor was requested to post the data sheets on their website to facilitate review.
    c. The high side pressure measurement location needs to be identified since it can vary for packaged units.
    d. The data sheets do not include the calculated cooling capacity.
    e. The superheat values are not reasonable values (-30).
5. Ken Peet and Vance Payne agreed to provide a thorough review of the data sheets and provide feedback. Mike Brambley and Keith Temple agreed to provide a cursory review.
6. The contractor will probably need a no cost extension for the project. (After the PMS meeting the contractor provided additional information. The contract completion date is April 30, 2006 and the contractor will need through the summer of 2006 to complete the testing.)
7. The PMS requested that the contractor be prepared to provide a presentation at the next PMS meeting to report on the status of the project including
    a. Progress relative to plan
    b. Details of the accomplishments
    c. Review of units tested, results, and remaining testing to be completed
    d. Preliminary conclusions from the results
    e. How is the project doing with regards to schedule and budget

8. The PMS requested that the contract start work on a draft of the final report and in particular an outline should be prepared to get feedback.
9. The PMS requested clarification on the approach that was decided upon for selecting units to service. Mike Brambley and John House agreed to review the selection approach.
10. A conference call was proposed, prior to the next PMS meeting, to review the status of the identified items.
11. The contractor was requested to post the original project schedule and an updated project schedule on their website.
12. A question was raised about PMS members and the TC chair receiving copies of the project quarterly reports, since none of the members could recall receiving them. John House will investigate.
13. The following schedule was proposed:

Item	Responsible	Due Date
Resolve website issue, post test data, and notify PMS	Contractor	2 weeks July 15, 2005
Review test data and provide comments	Ken Peet and Vance Payne (cursory review: Mike Brambley and Keith Temple)	4 weeks July 29, 2005
Provide clarification on unit selection approach	Contractor	2 weeks July 15, 2005
Review unit selection approach and provide comments	Mike Brambley and John House	4 weeks July 29, 2005
Provide original and updated project schedule on website	Contractor	4 weeks July 29, 2005
Prepare outline for final report	Contractor	September 2, 2005
Schedule conference call	Contractor and PMS Chair	Early September
Conference call	Contractor and PMS members	mid-September or early October

Please send any corrections or additions to these minutes to Keith Temple (katemple@fielddiagnostics.com)

E-mail directory:
Contractor: talereza@adm-energy.com; Dan@ADM-Energy.com
PMS: jhouse@energy.iastate.edu; michael.brambley@pnl.gov; rossi@fielddiagnostics.com; SLB4@PGE.COM; MICHAEL.BRAMBLEY@PNL.GOV; kpeet@lse-engineering.com; cscruton@energy.state.ca.us; jbraun@ecn.purdue.edu; Pantelis.Hatzikazakis@Lennoxind.com; katemple@fielddiagnostics.com

Others: piotr.domanski@nist.gov; vance.payne@nist.gov; mark1.d.johnson@honeywell.com; szymurski@ari.org; jandrews@bnl.gov

Appendix I.
1275-RP PMSC Notes

June 28, 2005
Notes by Phil Haves – PMSC Chair

The aim of the project is to evaluate fault detection and diagnosis (FDD) methods for existing chillers in the field. The contractor is Drexel University, Agami Reddy PI, with Purdue University as a subcontractor. Contractually, the project is due to finish March 29, 2006. Four FDD methods are currently being evaluated. They are all 'data-driven', i.e. empirical, methods; the starting point for each of the methods is the definition of Characteristic Quantities (CQ's), e.g. water temperature difference across the evaporator, and Characteristic Parameters (CP's), e.g. the thermal conductance of the condenser. The basis of each method is to use CQ's and CP's to indicate and, where possible, localize faults. A key part of the development of each method is identifying CQ's and CP's, or combinations thereof, that varying significantly in the presence of faults.

The PMS was given various additions and updates to the 120 page report received before the Orlando meeting; this document will evolve into the final report. In particular, the team responded to the recommendation made by the PMS at the Orlando meeting to set the thresholds for each method so as to produce the same rate of false positives before comparing the rates of correct detections and diagnoses. This rate was set by the investigators at 5%; there was some discussion about how to interpret this figure but the consensus was that it was high and the PI agreed to produce results using a 1% rate of false positives for comparison. There was a discussion as to whether loss of capacity should be used as a metric for assessing fault severity, in addition to reduction in energy efficiency. The consensus was that loss of capacity is important operationally; the issue became whether the experimental data generated in 1043-RP, which is the foundation for the current work, indicates whether the chiller is at full or part load. The data as published in the 1043-RP Final Report do not so indicate, but the PI of the current project undertook to confer with the PI of 1043-RP to determine whether that information is readily available. On a different point, it was confirmed by the PI that the methods being evaluated rely on having a measurement of the evaporator duty, and hence the water flow rate through the evaporator.

Bill McQuade, the PMS member from TC8.2, offered to arrange a meeting between the PI and engineers at York International to provide feedback on different aspects of the project.

A conference call between the PMS and the investigators will be held to discuss the results of re-analyzing the results using the agreed revisions to the evaluation method. Testing of the methods will then be performed using transient data, all results to date having been obtained using steady state data. The PI agreed to provide details to the PMS of the steady state detector to be used in the tests with transient data. The PI was also requested to provide more interpretation and explanation of the differences in performance of the methods in the Final Report.

Appendix J.
List of Subcommittee and Committee Attendees

Denver, CO – June 2005

	Main Committee	Technology Development	Communications & Integration	Testing & Evaluation	Research
Voting Members					
Osman Ahmed (V)					
Steve Blanc, (V)	X	X	X	X	
Michael Brandemuehl (V)	X	X	X	X	
James Braun (V)	X	X	X	X	
Arthur Dexter, International Member (V)					
Cliff Federspiel (V)					
James W. Gartner, CM	X				X
Rich Hackner, Program Subc. (V)	X	X	X	X	X
Phil Haves, (V)	X	X		X	X
Bill Healy (V)	X	X	X	X	X
John House, Chair (V)	X	X	X	X	X
Srinivas Katipamula, Tech. Dev. Subc. Chair (V)	X	X	X	X	X
Agami Reddy (V)	X	X	X	X	X
Jonathan Wright, International Member (V)					
Non-Voting Members					
Eric Adams					
Narendra Amarnani					
Peter Armstrong, CM		X		X	X
Gaylen Atkinson	X				
Don Aumann					
Kim Barker					
David Bornside	X				
Mike Brambley, Vice-Chair, Research Chair, CM	X	X	X	X	X
Dave Branson, CM					
Rob Braun					
Mark Breuker					
Barry Bridges, CM	X				
Martha Brook					
Marty Burns,CM					
Jim Butler, CM					X
Par Carling					
Natascha Castro, Testing & Eval Subc, Web Master	X	X	X	X	X
Daniel Choiniere					
Christian Christiansen					
Maria Corsi, CM	X	X	X	X	X
Yujie Cui					
Charles Culp, CM	X				
Sharon Dinges	X				
Piotr Domanski	X	X	X	X	X

	Main Committee	Technology Development	Communications & Integration	Testing & Evaluation	Research
Jon Douglas					
Andy Drysdale					
Chris Early					
Thomas Engbring, CM					
Mohsen Farzad					
Paul Francisco					
Adam Froehlich					
Theo Frutiger					
John Gallaher		X	X	X	
Brent Griffith					
Peter Gruber					
Carlos Haiad	X	X	X	X	X
David Hansen					
Kirstin Heinemeier					
Gregor Henze					
David Holmberg		X	X	X	
Mark Johnson	X	X	X	X	
David Kahn, CM					
George Kelly, CM	X	X	X	X	X
Richard Kelso					
Michael Kintner-Meyer		X	X	X	
Hofu Kiu					
Curtis Klaassen	X				
Erin Kruse					
Thoi H. Le	X	X	X	X	X
Damian Ljungquist					
Carol Lomonaco, CM,					
Haorong Li	X	X	X	X	X
Mingsheng Liu					
Tor Malmstron					
Rodney Martin					
Darrell Massie		X	X	X	X
Robert McDowall					
Chris Miller	X				
John Mitchell , CM					
Dan Mort					X
Ron Nelson, CM					
Les Norford	X	X	X	X	X
Zach Obert					
Robert Old, CM	X	X	X	X	
Vance Payne		X	X	X	X
Hung Mahn Pham, CM					
Bill Peinta	X				
Janice Peterson	X				
Kinga Porst, CM					

	Main Committee	Technology Development	Communications & Integration	Testing & Evaluation	Research
Michael Pouchak					
Andrew Price					
Barry Reardon, CM					
Wayne Reedy					
Paul Reimer					
Glenn Remington, CM					
Todd Rossi, CM, Secretary					
Tim Salsbury					
Jeffrey Schein					
Chris Scruton					
John Seem, CM					
Virgil Seribo					
David Shipley					
Ashish Singhal	X				
Vernon Smith	X		X	X	X
Pornsak Songkakul, CM	X	X	X		
Gene Strehlow	X				
Changlin Sun					
Steven Szymurski					
Peter Tsilivis					
Keith Temple	X				
Matthew Tyler, CM					
Hossein Vaezi-Nejad					
Arun Vohra	X				
Dave Underwood					
Jean Christopher Visier					
Jin Wen	X	X	X	X	X
Jonathan West					
James Winston, CM					
Peng Xu,Comm. & Int. Subc. Chair, CM		X	X	X	
Chariti Young, CM	X				
Miao Yang					
Jensen Zhang					
Song Zhang					
Xiaohui Zhou	X	X	X	X	X